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TWO NEW SPECIES OF *SMITHISTRUMA* BROWN (HYMENOPTERA: FORMICIDAE) FROM FLORIDA

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Abstract.—Two new species of dacetonine ants are described from Florida. ***Smithistruma inopina*** known from three dealate queens, is aberrant for the genus in its triangular mandibles with small teeth, its lack of any specialized, broadened hairs, lack of spongiform appendages on the petiole, postpetiole, and gaster, lack of reticulate sculpture (except on the head), and lack of antennal scrobes. This species is provisionally assigned to *Smithistruma* because all the characters listed above occur in variable states within the genus and the basic structure of this ant (except for the mandibles) is similar to various species of *Smithistruma*. There is weak circumstantial evidence that this species is a social parasite. ***Smithistruma archboldi,*** known from numerous workers and queens, is distinguished by having both a wedge-shaped head and a conspicuous gap between the apical series of mandibular teeth and the clypeal border. This species seems to occur in the transition zone between xeric uplands and riparian or lakeside forest.

Key Words: Formicidae, Dacetonini, *Smithistruma*

The genus *Smithistruma* Brown, which includes 104 described species, is widely distributed in all geographic regions except for Australia (Bolton 1995). The southeastern United States, with 25 described species (including the two described below), is one of the world centers of distribution of the genus. Since members of the genus are small (usually about 2 mm in length), cryptic in habits, and slow moving, it is not surprising that new species are still being described from the southeast.

North American members of the genus *Smithistruma* can be distinguished from other myrmicine ants by the following combination of characters: antenna with six segments; mandibles in a frontal view of the head approximately triangular and not strongly bowed. In all species except for one of those described below, the head, especially the clypeus, is equipped with conspicuous modified hairs that are usually clavate or spoon-shaped, or elongate and apically curved. Outside of North America the boundaries of the genus *Smithistruma* have become increasingly blurred by the discovery of species apparently intermediate between *Smithistruma* and several other genera of dacetonines (Brown 1973, Bolton 1983). At this point there is no generally accepted solution to this problem, and until there is a convincing revision of the genera of the short-jawed dacetonines, we will continue to use the name *Smithistruma*. Since the type species of *Smithistruma* is from southeastern North America, the use of the name for species native to this region is not likely to lead to much confusion.

Smithistruma inopina Deyrup and Cover, new species
(Fig. 1)

Diagnosis.—Clypeus, antennal scapes, dorsum of mesosoma, gaster with coarse hairs rising from conspicuous punctures; no broadened or flattened hairs on head, body, or appendages; spongiform appendages absent; antennal scrobes absent.

Description of holotype female.—Measurements in mm: Total length (calculated as in Brown 1953): 2.40; head length: .62; head width: .36; length of mesosoma: .56.

Mandible in frontal view narrowly triangular, basal tooth an isoceles triangle, teeth of apical series small, longest about half as long as length of basal tooth, first and third longest, subequal, second and fifth subequal, about half length of first and third, fourth and sixth to eighth small, subequal; clypeus shining, with a small median submarginal tubercle and sparse conspicuous tapering hairs arising from punctures; remainder of head finely punctate, with moderately dense tapering hairs; long, flagelliform hairs absent on head; antennal scrobes absent; antennal scapes with sparse tapering hairs arising from punctures, hairs along inner edge proclinate on proximal third of scape, reclinate on distal two thirds of scape; head in frontal view wedge-shaped, as in *Smithistruma clypeata* (Roger) (Fig. 3).

Dealate, wing stumps present, flight structures well developed; pronotal angle rounded, sides of mesosoma not concave anteriorly; pronotum, mesonotum, metanotum, propodeal declivity smooth, shining, with sparse, curved, tapering hairs; sides of alitrunk smooth, shining; propodeal spines short, not subtended by a lamina; coxae smooth, shining, anterior surfaces with sparse tapering hairs; femora and tibiae with sparse proclinate tapering hairs.

Petiole, postpetiole, and base of gaster without spongiform appendages; gaster without grooves on first tergite; dorsum of petiole, postpetiole, and gaster smooth, shining, with sparse, tapering, curved hairs rising from punctures.

Color yellowish brown.

Types.—Dealate ♀, holotype and 2 paratypes. Holotype: FLORIDA: Putnam Co., Ocala National Forest, Rodman Resevoir, on blazed trail near parking lot, at base of pine, wet flatwoods habitat, 10 Dec. 1994, M. Deyrup. Paratypes: FLORIDA: Marion Co., 9 miles SSW of Ocala, in Ocala Waterway Development, sand pine scrub habitat, 16 Oct. 1990, M. Deyrup, 1; Alachua Co., Alachua County Fairgrounds, at base of pine, flatwoods habitat near parking lot, 23 Feb. 1986, C. Johnson, 1.

Holotype and one paratype in the Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; one paratype presently in the arthropod collection of the Archbold Biological Station, Lake Placid, Florida.

Etymology.—*Inopina* (Latin), "unexpected," referring to the novel suite of character states displayed by the species.

Position in taxonomic guides.—*Smithistruma inopina* cannot be identified to genus in Cover's key (in Hölldobler and Wilson 1990) and dead ends at couplet 3 in Brown's key to Nearctic *Smithistruma* (1953). Both of these keys are designed for workers only, although Brown's key works well for all other queen *Smithistruma*.

Discussion.—*Smithistruma inopina* is described from three females, with no workers or males available. These specimens are the result of a survey, involving thousands of Berlese funnel samples, of the ants of Florida. Since the collecting phase of this project is almost complete, there is little chance that more specimens will be found soon. The next phase of the project, the preparation of a manual of the ants of Florida, requires names for as many species as possible, even if they are known from only a few specimens.

All three specimens were extracted by Berlese funnel from thick pine litter. The holotype was at the base of a *Pinus elliottii* Engelmann in wet, open flatwoods with

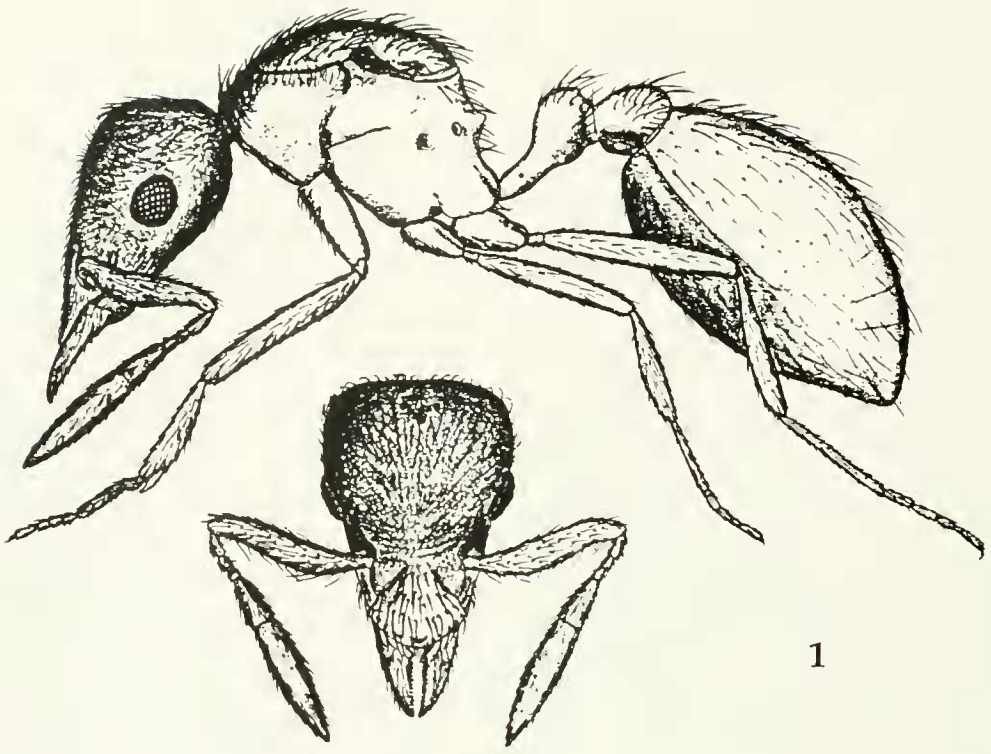

Fig. 1. *Smithistruma inopina*, dealate female.

Myrica cerifera L. and *Quercus nigra* L. along a trail by the Rodman Dam parking lot. The same sample of about two liters of unsifted litter included a large colony of *Smithistruma clypeata* (Roger) with a queen, a colony of *Paratrechina faisonensis* (Forel) with alates, numerous workers of *Pheidole dentigula* Smith, and a few workers of *Hypoponera opacior* (Forel). The Marion County paratype was from a xeric site with thick litter under dense *Pinus clausa* Chapman ex Engelmann and dense scrub oaks, *Quercus myrtifolia* Wildeman and *Quercus geminata* Small. The same two-liter unsifted sample included workers of *Smithistruma talpa* (Weber), *Solenopsis carolinensis* Forel, and *Paratrechina wojciki* Trager. The Alachua County paratype was from litter taken at the base of a pine, probably *Pinus elliottii*. The same sample included a large colony of *Smithistruma dietrichi* (Smith).

There is some circumstantial evidence that *S. inopina* might be a workerless parasite. 1. The species appears to be very rare; parasitic ants are frequently rare (Hölldobler and Wilson 1990), known from only one or a few collections. There are, however, other dacetonines that are rarely collected in Florida, for example *Smithistruma cloydi* Pfitzer, *S. abdita* (Wesson and Wesson), and *S. angulata* (Smith). 2. Only females are known. This is consistent with the social parasite hypothesis, but not supportive, since several other rare Florida *Smithistruma*, for example *S. angulata* and *S. pilinasis* (Forel), are also represented by solitary dealate females more often than one might expect. We assume that this means that the colonies of these species are not only rare, but also in microhabitats that are difficult to sample, so the species is most widely dispersed in the form of queens prospecting for a nest site, rather than as foraging workers. 3. All three females were taken in relatively small samples that also included

other species of *Smithistruma*. If *S. inopina* is parasitic, its hosts are most likely to be, according to "Emery's rule," close relatives (Hölldobler and Wilson 1990), i.e. other *Smithistruma*. 4. Species of *Smithistruma*, as well as other dacetonines, are characterized by modifications, often elaborate, of the mandibles, pilosity, cuticular sculpture, grooves and depressions of the head and body, and spongiform appendages. Queens share most or all of the morphological elaborations of conspecific workers. The function of these character states is not understood in any specific way, but it seems likely that they are associated with defense and prey capture. The absence of all typical dacetonine elaborations in *S. inopina* suggests that this species makes its living in some novel way. One of the features of many parasitic ants is the loss of cuticular sculpture (Hölldobler and Wilson 1990). A sparse pilosity of curved, tapering, suberect hairs is typical of the parasitic genera *Stronglyognathus* Mayr, *Protomognathus* Wheeler, and *Harpagoxenus* Forel; in the cases of the latter two genera, this pilosity contrasts with the short, scale-like hairs of the hosts. *Smithistruma margaritae* (Forel) approaches *S. inopina* in its lack of antennal scrobes, the position of the eyes far from the ventral margins of the head, the greatly reduced spongiform appendages, and the lack of grooves at the base of the first gastral tergite. This could be a convergence based on some degree of dependence on other species, especially for defense. In Trinidad one author (MD) and Lloyd Davis observed workers of *S. margaritae* mingled in a foraging column of *Wasmannia auropunctata* (Roger) moving along a piece of plastic irrigation pipe on an open hillside each morning for three consecutive days. Returning to the site two years later, Lloyd Davis (personal communication) found this mixed foraging column still occurring. We do not suggest that *S. margaritae* is parasitic, only that it may have an unusual relationship with other ants.

We are assigning *inopina* to *Smithistruma*, rather than proposing a new genus, in spite of its lack of a number of superficial characters typical of *Smithistruma*. This decision is based on two considerations. The first is that the characters involved, such as enlarged mandibular teeth, expanded and flagelliform hairs, cuticular sculpture, and spongiform appendages, although present in other *Smithistruma*, vary remarkably from species to species, showing that they are labile in an evolutionary sense. The absence of these features can, with only a slight lurch in logic, be interpreted as another expression of this variability. The second consideration is that the general structure of the head, except for the shape of the mandibles, is very similar to that of other *Smithistruma* of the southeastern U.S., and not similar to any other genus of dacetine ants.

Smithistruma archboldi Deyrup and Cover, new species

(Fig. 2)

Diagnosis.—Head, in frontal view strongly wedge-shaped, the result of convergent ocular lamellae and a narrow clypeus; shape of head therefore resembling that of a number of other species such as *S. clypeata* (Fig. 3), *S. ohioensis* (Kennedy and Schramm) and *S. laevinasis* (Smith), but unlike these and other species with a wedge-shaped head, *S. archboldi* has a conspicuous gap between the apical series of teeth and the clypeal border.

Description of holotype worker.—Measurements in mm: Total length (calculated as in Brown 1953): 1.91; head length: .51; head width: .33; length of mesosoma: .54.

Mandible in frontal view with a broadly based triangular lamina, tapering gradually apically, terminating at about midlength; a conspicuous gap between most proximal teeth of apical series and clypeal border; 8 teeth in apical series, second longest, first and fourth subequal, third about half length and much more slender than second, teeth 5–8 slightly shorter than third; clypeus finely reticulate, not shining, about as long as

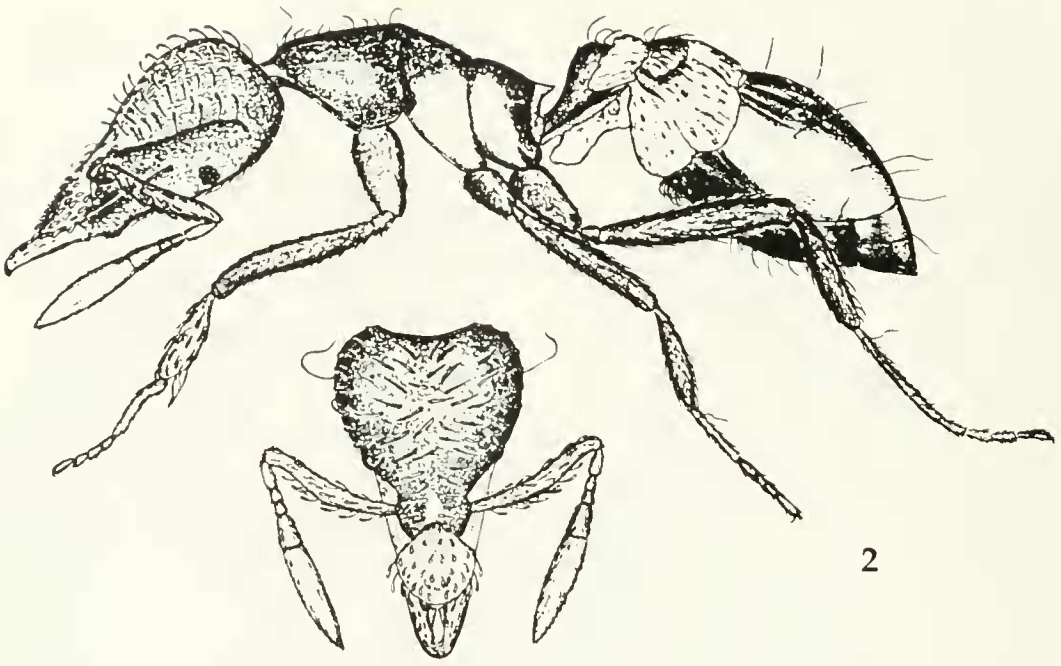

Fig. 2. *Smithistruma archboldi*, worker.

wide, with a submarginal median tubercle, anterior border evenly rounded, with 12 elongate, spatulate, marginal hairs curved toward midline, disc with small, sparse, curved, spatulate hairs; head in frontal view wedge-shaped, with converging ocular lamellae, as in the *clypeata* group of Brown (1953); head strongly reticulate, except for small frontal triangle; enlarged hairs on front of head elongate, curved, slightly broadened; a flagelliform hair on each side of vertex; antennal scapes curved at basal third but not angulate, inner borders of scapes with a row of elongate spatulate hairs, all proclinate.

Body and legs as in Fig. 2. We find no consistent differences in the body and legs between *S. archboldi* and *S. talpa* (Weber) (Fig. 4). For a description of *S. talpa* and the *talpa* group, see Brown 1953.

Color light ferrugineous.

Description of female.—Measurements in mm: total length (calculated as in Brown 1953): 2.53; head length: .59; head width: .42; length of mesosoma: .67.

Usual queen modifications present: ocelli present, compound eyes large, mesosoma modified for flight. Otherwise resembling the holotype worker, including the diagnostic characters of a wedge-shaped head in frontal view, conspicuous gap between the apical series of mandibular teeth and clypeal border, and type and disposition of hairs on clypeus.

Types.—Holotype worker, 210 worker and 8 dealate ♀ paratypes. Holotype, 1 dealate ♀, 19 worker paratypes: FLORIDA: Lake Co., Ocala National Forest, Road 445 at Alexander Springs Creek, mesic oak and pine forest, west side of creek on south side of road, 3 Sept. 1995, M. Deyrup. Paratypes: 11 workers, same site as holotype, 2 Apr. 1992, M. Deyrup and B. Ferster; 42 workers, 1 dealate ♀: FLORIDA: Putnam Co., three miles east of Melrose, Ordway Preserve, near Lake Rowen, Berlese sample, 24 Feb. 1995, Lloyd R. Davis; 28 workers: Putnam Co., three miles east of Melrose, Ordway Preserve, Berlese sample OK021195-B, 11 Feb. 1995, Lloyd Davis;

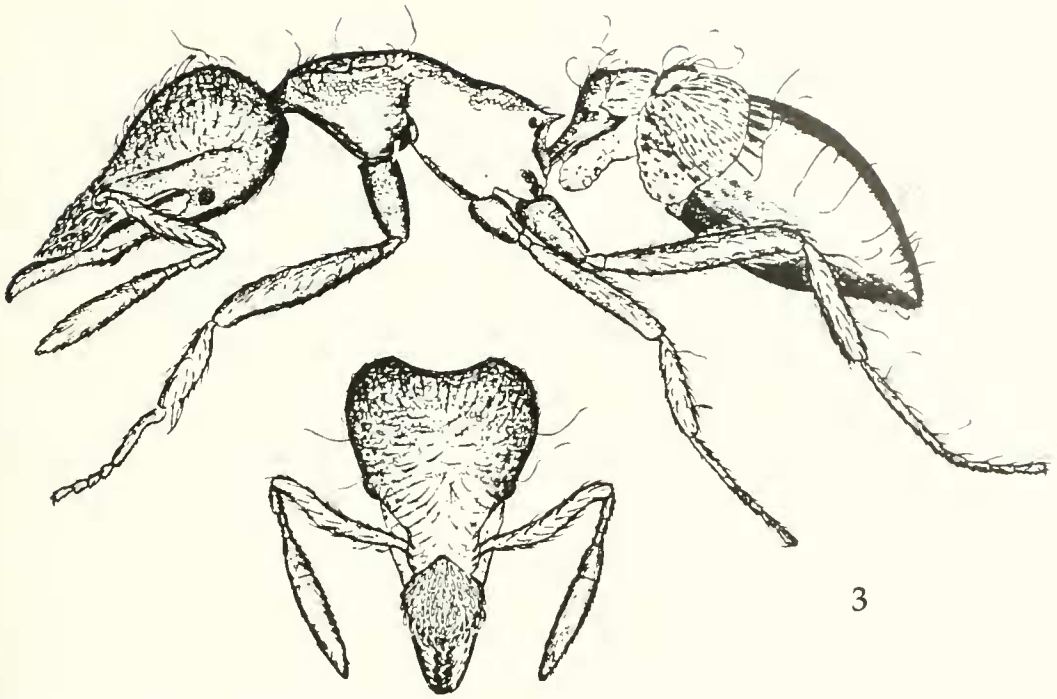

Fig. 3. *Smithistruma clypeata*, worker.

23 workers, 1 dealate ♀: Volusia Co., Spruce Creek Nature Conservancey Preserve, 22 Oct. 1994, M. Deyrup, B. Ferster, Z. Prusak; 7 workers, 1 dealate ♀: Bradford Co., Starke, 30 Apr. 1993, Lloyd R. Davis; 51 workers, 1 dealate ♀: Bradford Co., Hampton, 30 Apr. 1993, Lloyd R. Davis; 1 dealate ♀: Volusia Co., Deland, oak litter from vacant lot, 25 Dec. 1985, M. Deyrup; 1 dealate ♀: Putnam Co., Rodman Resevoir, scrub just west of dam, 3 Apr. 1988, Clifford Johnson; 1 dealate ♀, 11 workers: Alachua Co., Gainseville, mesic hammock by hospital, 24 Jul. 1986, Clifford Johnson; 1 dealate ♀, 7 workers: Bradford Co., Keystone Heights, 2 miles west, north side of Little Santa Fe Lake, 23 Feb. 1995, Lloyd Davis; 1 worker: Jefferson Co., Capps, 1 mile east, U.S. 19–27, in leaf litter, 24 July 1965, Walter Suter; 10 workers: GEORGIA: Charlton Co., St. George, 6 miles south, leaf litter from magnolia, pine and cypress swamp, 18 Aug. 1965, Walter Suter.

Holotype, 32 workers, 3 dealate ♀: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; 18 workers: National Museum of Natural History, Smithsonian Institution, Washington, D.C.; 20 workers, 1 dealate ♀: Los Angeles county Museum; 21 workers, 1 dealate ♀: The Natural History Museum, London; 18 workers: Florida State Collection of Arthropods, Gainesville, Florida; 9 workers: Canadian National Collection, Ottawa, Ontario; 6 workers: Field Museum, Chicago, Illinois; 7 workers: collection of Mark DuBois, Washington, Illinois; 7 workers: collection of William MacKay, El Paso, Texas; 7 workers: collection of Philip Ward, University of California, Davis, California; remaining paratypes in the arthropod collection of Archbold Biological Station, Lake Placid, Florida.

Etymology.—This species is named for Richard Archbold, who founded the Archbold Biological Station, which has support-

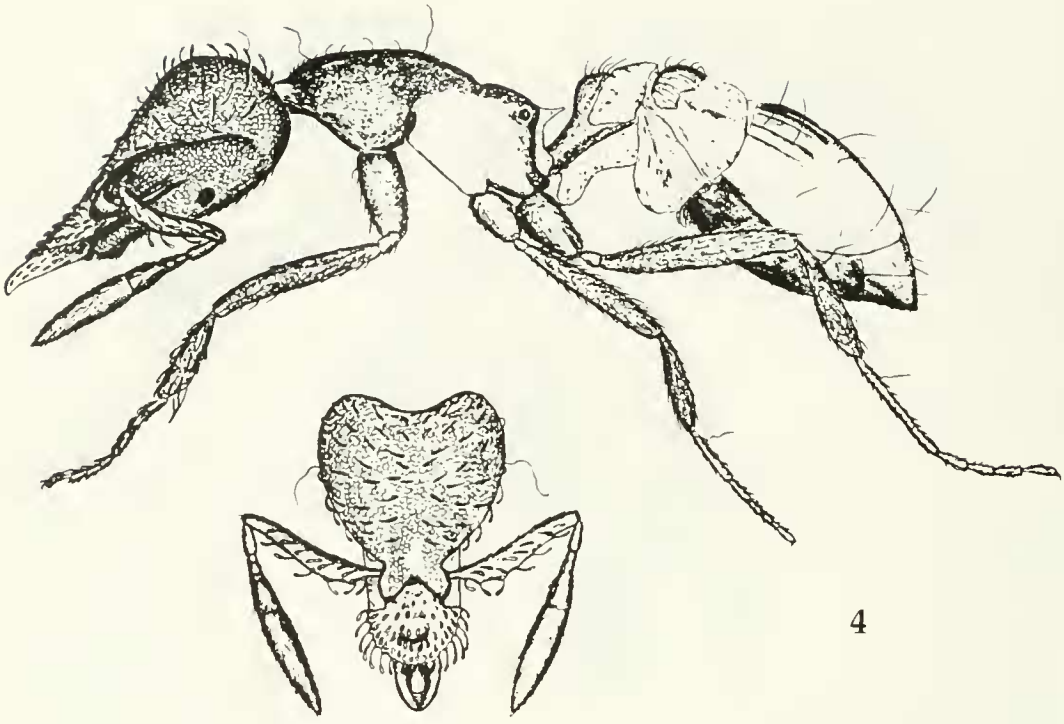

Fig. 4. *Smithistruma talpa*, worker.

ed a survey of Florida ants for the past decade.

Position in taxonomic guides.—In the most recent key to the Nearctic species of *Smithistruma* (Brown 1953), *S. archboldi* encounters an impasse at couplet 10. This is because previously described species with a wedge-shaped head (e.g. *S. clypeata*, Fig. 3) do not have a conspicuous gap between the clypeal border and the apical series of mandibular teeth (the "mandibular diastema") while species that have a conspicuous diastema also have the sides of the head more or less parallel beyond the occipital lobes (e.g. *S. talpa*, Fig. 4). This means that *S. archboldi* does not fit into any currently defined species group of *Smithistruma*; this is of little significance, since these groups are "connected or seemingly connected in all directions by intergradient forms, so that most of the limits . . . are to be considered artificial conveniences of a temporary sort" (Brown 1953).

Discussion.—Most of the collections of *S. archboldi* are from riparian or lakeside habitats with mixed conifer and broadleaf trees. A preference for relatively narrow ecotonal bands of habitat might explain why this species was not collected and described long ago. It is also possible that the species is restricted to uplands of the southeastern coastal plain, where sandy soils reduce the incidence and duration of flooding along the shores of streams and lakes.

It is reasonable these days to consider the conservation status of newly described species if, as in the case of the two described above, there is reason to believe that the species are rare, localized, or have narrow habitat requirements. *Smithistruma inopina* is known from the northern border of Ocala National Forest (the holotype locality) and from another site not far from the western side of the forest. Since the Ocala National Forest is a huge tract (380,000 acres), much of which is maintained in relatively natural

habitats, the chances are good that there are protected populations of *S. inopina* that should be able to persist within the forest. The holotype locality of *S. archboldi* is also within the Ocala National Forest, and many of the paratypes are from the Ordway Preserve, administered by the University of Florida, or the Spruce Creek Preserve, administered by the Nature Conservancy. The latter site serves as a reminder that habitat destruction is not the only threat to many species of arthropods. At Spruce Creek there are populations of the exotic dacetonines, *Strumigenys eggersi* Emery and *S. rogeri* Emery, two species that appear to have replaced most of the native dacetonines at several of our survey sites in central Florida.

Southeastern *Smithistruma* are centered around the southern Appalachians, with some species having ranges extending up to southern New England, or down into Florida, or west to eastern Texas. Because of the consistency of this pattern, we suspect that the two species described here will be found to have ranges considerably north of the localities listed above. Aside from the 25 species of *Smithistruma* known from the southeastern U.S., there are a few species found in relict mesic areas of the southwest (Ward 1988). Several species have been described from Japan (Bolton 1995) and there are apparently a number of undescribed Japanese species that have been listed on the World Wide Web. Brown (1953) suggested that U.S. *Smithistruma* are most closely related to the Asian species. All this distributional evidence suggests that all the native Northern Hemisphere representatives of *Smithistruma* are faunal vestiges of the spectacularly diverse warm-temperate arcto-tertiary forests that were widespread in the Miocene (Raven and Axelrod 1978). *Smithistruma* is the only speciose group of ants that shows this pattern.

Acknowledgments

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Literature Cited

Bolton, B. 1983. The Afrotropical dacetine ants (Formicidae). Bulletin of the British Museum (Natural History) Entomology Series 46: 267–416.

Bolton, B. 1995. A New General Catalogue of the Ants of the World. Harvard University Press, Cambridge, Massachusetts. 504 pp.

Brown, W. L., Jr. 1953. Revisionary studes in the ant tribe Dacetini. American Midland Naturalist 50: 1–137.

Brown, W. L., Jr. 1973. A new species of *Miccostruma* (Hymenoptera: Formicidae) from West Africa, with notes on the genus. Journal of the Kansas Entomological Society 46: 32–35.

Hölldobler, B. and E. O. Wilson. 1990. The Ants. Harvard University Press, Cambridge, Massachussetts. 732 pp.

Raven, P. H. and D. I. Axelrod. 1978. Origin and relationships of the California flora. University of California Publications in Botany 72: 1–134.

Ward, P. S. 1988. Mesic elements in the western nearctic ant fauna: Taxonomic and biological notes on *Amblyopone*, *Proceratium*, and *Smithistruma*. Journal of the Kansas Entomological Society 61: 102–124.